Summer 2017

Supply Chain Performance in the Pharmaceutical Industry in Pakistan

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SUPPLY CHAIN PERFORMANCE IN THE PHARMACEUTICAL INDUSTRY IN PAKISTAN

A Thesis
Presented to
The Faculty of the Department of Architectural and Manufacturing Sciences
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Master of Science

By
Fakir Moiz Bokhari

August 2017

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Date Recommended 5/12/2017

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I dedicate this thesis to my parents, Iqtidar and Zareen, who supported me at every step throughout the life. I would also like to be thankful to my both aunts and uncle Amina, Arnawaz and Bahadur, who helped me morally. I would also dedicate my thesis to both my grandmothers Amna Khan and Tahira Begum whose endless blessings and prayers made it possible for me to achieve my goals. And last but not least, my sister Maha, who is a great well-wisher to me.

ACKNOWLEDGMENTS

I thank ALLAH THE ALMIGHTY for his unlimited blessings HE bestowed upon me. HE gave me the opportunity to make my parents proud completing my graduate studies

I would like to thank my committee chair Dr. Daniel Jackson for his impeccable support, and proper guidance at every step of my thesis. I would also like to highlight his devotion which made me polish my skills more.

I would like to thank my committee member Dr. Douglas Chelson; he provided me with the opportunity to expand my horizon to different disciplines under his outstanding teaching methods.

I would like to thank my committee member, Dr. Brent Askins, for honoring the research, and for his commitment as a thesis member.

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This research paper investigated the performance of the supply chain system in the pharmaceutical industry in Pakistan. The study was based on the hypothesis that the adopted supply chain systems lack proper structures to deal with the challenges of the business environment in which they operate, and as such were underperforming.

Therefore, the objective was to ascertain the nature and the dynamics of the SCM (Supply Chain Management) system used in the drug industry. The objectives of the research were anchored on three factors that include Supply Chain Flexibility/Agility Performance, Supply Chain Resource Performance, and Supply Chain Output Performance. These three metrics were used to describe the independent variable which comprises the supply chain performance of Pakistan's pharmaceutical industry. The research data was collected through questionnaires that would make it possible to analyze and interpret information gathered.

The questions were administered to a sample of the players that represent every sector of the industry (multinationals, local manufacturers, retailers, and regulators). The final results of the study support or discourage the hypotheses that 1) Manufacturers struggle to manage lead-time as a result of factors such as government. 2) Manufacturers lack satisfactory levels of performance in terms of Supply Chain Flexibility/Agility Performance, Supply Chain Resource Performance, and Supply Chain Output Performance.

Introduction

Pakistan became an independent country in 1947 and a few decades ago established its own pharmaceutical industry supply chain framework. Beginning with approximately twenty pharmaceutical operating and production units that manufactured finished dosage drug forms and supplied active drug ingredients to their peers in the local and international market, the country now has hundreds of such units. This serves as evidence to the notion that the size of the country's pharmaceutical industry's supply chain framework has grown considerably. It makes sense for the government and the industry's stakeholders to invent and implement new ways to revitalize the country's pharmaceutical industry so that it can post significant improvements in productivity, efficiency, ethics, and profitability (Ahmed & Jalees, 2008).

One of the methods in which analysts describe and evaluate the performance of an industry, or even that of an individual organization within the industry in question, was to look at the volume of trade in terms of processing and exchanging goods and services within and outside the said industry. Pakistan's pharmaceutical industry was one of the fastest growing industries in the territory of emerging economies. Between the years 2014 and 2015, its pharmaceutical industry managed to reach $212 million in export turnover (Business Mirror, 2016). This was still small compared to the export turnover values that were being posted by Western, European and Asian countries that already had a mature pharmaceutical industry supply chain. This disparity suggests that there are numerous improvements that the government and the members of the private sector could make in order to make the pharmaceutical industry and the underlying supply chain

framework that supports it more globally competitive and productive (Ahmed & Jalees, 2008).

Supply Chain Flexibility was one of the key variables that was examined in the paper. Supply Chain Management can be a complex and at the same time volatile process. The unpredictability of both the internal and external supply chain variables can have a significant impact on the outcomes of an entire industry, or in this case, Pakistan's pharmaceutical industry. The assumption was that the more flexible a supply chain framework for the pharmaceutical industry is, the more resilient it would be when facing external and internal shocks. Resource and Output Performance are variables that focused on the internal management of an industry's supply chain network. The stability of on-time deliveries, quality control measures and the overall success of the flow of goods and services from one end of the supply chain network to another were examples of the processes involved in Resource and Output Performance. Generally, a supply chain framework that had a more stable Resource and Output Performance was a more valuable one. Additionally, Resource and Output Performance weakness could add to the volatilities and uncertainties in the management of an industry's supply chain network. In an ideal scenario, both the levels of Supply Chain Flexibility and Resource and Output Performance should hover consistently at an optimum performance level in order to ensure the successful delivery of goods and services from the initial to the end of the network.

Problem Statement

Supply chain management performance of the pharmaceutical industry in Pakistan was not up to par with the global average. At present, Pakistan's pharmaceutical

industry's supply chain framework still relies on old technologies in relation to drug discovery and development models. Some pharmaceutical firms in the country have been implementing more modern methods than the others, but the quality and precision of this execution is still questionable. It was worth noting these problems and limitations are not uncommon and therefore should only be expected from a still developing industry such as the one being discussed in this paper (Business Mirror, 2016).

Significance of the Research

The significance of the research is to conclude whether there is an actual need for the supply chain management performance of Pakistan's pharmaceutical industry to improve or otherwise. This paper aimed to suggest that the supply chain performance in Pakistan's pharmaceutical industry is weak and can benefit from further improvements. This study indicated areas where supply chain management could be improved and could benefit pharmaceutical companies. In general, improvements in Pakistan's pharmaceutical industry's SCM processes would benefit the patients, medical and healthcare professionals, medical and healthcare business organizations, the entire pharmaceutical industry, and eventually, Pakistan's economy.

Purpose of the Research

The purpose of the study was to ascertain the perceptions of industry professionals regarding agility/flexibility performance, resource performance, and output performance of supply chain management of the pharmaceutical industry in Pakistan. An attempt was then made to apply this additional information from the field in order to effect improvement in the supply chain management of pharmaceutical industry in Pakistan. Based on the objective of the study to ascertain the nature and the dynamics of

the SCM systems used in the drug industry, data collection was focused on three factors, namely supply chain flexibility or agility performance, resource performance, and output performance. Collection of data was achieved through questionnaires that provide standardized responses that could be compiled for qualitative and quantitative analysis. The purpose was to determine whether the Pakistani pharmaceutical industry's supply chain performance is indeed struggling. The type of data that was collected was responses from a sample population of 60 Pakistani pharmaceutical firm employees, using a customized questionnaire.

Research Questions

The independent variable was the supply chain performance of Pakistan's pharmaceutical industry. The dependent variable, on the other hand, was the perceptions of industry professional in Pakistan's pharmaceutical industry. This means there are two negatively performing sectors here: Pakistan's pharmaceutical industry and Pakistan's pharmaceutical industry supply chain network.

The research questions associated with the study were as follows:

1. Do pharmaceutical industry professionals in Pakistan perceive growth is restricted by inadequacies in the SCM (Supply Chain Management) models used by the industry participants in Pakistan?
2. Do pharmaceutical industry professionals in Pakistan perceive Pakistan's pharmaceutical industry supply chain performance is underperforming?
3. Do pharmaceutical industry professionals in Pakistan perceive a problem regarding flexibility and agility in supply chain performance of the pharmaceutical industry in Pakistan?

4. Do pharmaceutical industry professionals in Pakistan perceive a problem regarding resource performance in the supply chain management of the pharmaceutical industry in Pakistan?
5. Do pharmaceutical industry professionals in Pakistan perceive a problem regarding output performance in the supply chain performance of the pharmaceutical industry in Pakistan?

Assumptions

The assumptions of this study were as follows:

1. The key assumption in this study was anchored on the discussion that was already covered in the Research Questions and Hypothesis section.
2. It was also assumed that the pharmaceutical industry's SCM practices play an integral role in maintaining a fully functional pharmaceutical industry.
3. In terms of the sampling techniques and procedures, it was assumed that the chosen samples will be representative of the target population (i.e. professionals within the pharmaceutical industry).

Limitations

The limitations of this study were as follows:

1. The major limitation of this study was that it will not cover factors relating to global market dynamics that affect the pharmaceutical industry in general.
2. Only a small sample population size of 60 was used in the study**.**

Delimitations

The delimitations of this study were as follows:

1. The study was delimited to focus only on the pharmaceutical industry and its supply chain performance. Although general supply chain management and performance concepts were used, its application in the Pakistani pharmaceutical industry was prioritized.
2. This limitation was intentional in that this paper focused on the relationship between supply chain performance and the state of the Pharmaceutical Industry in Pakistan, using responses from the sampling population of 60 Pakistani pharmaceutical industry employees. The actual global pharmaceutical industry, however, has been included in the discussions.

Definition of Terms

1. Supply Chain Performance - Refers to how well an organization manages its lead time, working capital, and inventory in realizing strategic production, profits, and market goals.
2. Supply Chain Management - Refers to the collection of practices that are related to an industry's Supply Chain Network.
3. Pakistan's Pharmaceutical Industry - Refers to all the participants in Pakistan's pharmaceutical industry supply chain, a collection of firms, businesses, and corporations
4. Supply Chain Flexibility/Agility Performance - Refers to how flexible or agile an industry's supply chain framework in terms of adapting to changes, new trends, and volatilities (e.g. breakdowns, supply disruptions).
5. Supply Chain Resource Performance - Paints an overall picture of how the key processes within the supply chain system are being processed, and how the

sample population perceives them in terms of profitability, productivity, and efficiency.

6. Supply Chain Output Performance - Paints an overall picture of how outcomes are presented by an industry's supply chain framework as a whole, addresses aspects like sales, on-time delivery rates, shipping errors, and customer complaints.

Review of Literature

Pakistan's pharmaceutical industry is growing at a very fast rate (Zaman, 2011). There is an ongoing trend that suggests that companies that focus on adapting to the continuously changing consumer behaviors are going to continue to dominate the industry (Khalique, Shaari, Abdul, Isa, & Ageel, 2012). This is the same model that other more developed national level pharmaceutical industries have been following and if that is to be used as a basis, then it would be safe to suggest that Pakistan's pharmaceutical industry would also have the same outcome (Zaman, 2011).

Just like any other industry that is dominated by the private sector, the Pakistani pharmaceutical industry is dependent on various variables. Generally, these are variables that can be categorized as political, economic, or social (Malik & Kotabe, 2009). These variables can be used as determinants or even predictors of the future state of the country's private sector dominated industries, one of which is the pharmaceutical industry. Among the three broad categories of private sector led industry variables and predictors, the ones that are related to the country's economy (i.e. economic variables) have had the biggest impacts on the pharmaceutical industry and its supply chain framework's performance (Malik & Kotabe, 2009).

Pakistan's economy has been suffering as a result of the numerous geopolitical conflicts that its government has been involved in (Cohen, 2002). The wars that the country has waged against terrorism, for example, pose major economic risks that the country's government is yet to fully resolve (Cohen, 2002). It has been established in previous studies that the presence and persistence of geopolitical events such as war and widespread terrorism have a negative overall impact on the economy (Bilgin & Morton,

2002). An economy that is hindered by these negative risks can never grow to its full potential, especially when compared to regional and international peers that are not subject to the outcomes of wars and other geopolitical conflicts. The country's pharmaceutical industry is one of the many private sectors led industries at risk of being disrupted as a result of this longstanding problematic geopolitical situation. (Bilgin & Morton, 2002).

Aside from geopolitical conflicts and risks, Pakistan's economy has also shown signs of uncontrollable domestic inflation, a slow rate of gross domestic product and overall economic growth, and the substantial devaluation of the national currency relative to its regional peers and the most heavily traded basket currencies such as the Dollar, Euro, Pound, and Yen (Ali, Rehman, Yilmaz, Khan, & Afzal, 2010). There is little to no doubt that the government is taking real steps to come out of this challenging situation, but the question is whether it has been enough to uplift the economy? (Ali, Rehman, Yilmaz, Khan, & Afzal, 2010). Discussing the economy is relevant in the case of Pakistan's pharmaceutical industry in that a healthy and fully functioning economy is one that can support the growth of private sector led industries such as the pharmaceutical industry, including all of the firms that operate within it and the ones that are connected to it via the complex pharmaceutical industry's supply chain framework (Shah, 2004).

According to a Market Realist report that cited Moody's article on the global pharmaceutical industry, the industry-wide outlook has been changed from positive to stable, referencing the continuous strengthening of the U.S. Dollar, the rising costs of research and development, and the lower levels of pricing flexibility that eventually has eaten away a significant portion of the pharmaceutical firms' profitability as some of the

major risks have been exposed (Dabney, 2016). Currently, the global pharmaceutical industry is worth $1.072 Trillion in terms of revenues, making it one of the most lucrative and at the same time, integral industries worldwide (Statista, 2017). From a long-term perspective, analysts expect the industry to grow at an annual rate of 8%. When it comes to industry revenue and market share, Pakistan lags behind its peers in the west and the Pacific, namely the United States, the European Union, and Japan, which controls 48%, 28%, and 12% of the total world pharmaceutical market respectively (Statista, 2017).

Stakeholder Analysis of Pakistan's Pharmaceutical Industry

Patients. Using the pattern that was developed by developed countries with a well-developed healthcare sector (e.g. the United States, Canada, and Scandinavian Countries), it would be safe to suggest that accessibility, affordability, and the quality of the products and services being offered are the top three concerns. A good case in point would be the United States' Affordable Care Act which highlights the targeted improvements on these three aspects of healthcare. This is arguably the same pattern that emerging countries like Pakistan are trying to follow. What the implementation of this model creates is a medical and healthcare environment that benefits the patients or in the case of the pharmaceutical industry's supply chain network, the end-users or consumers of the drugs and pharma products.

Medical and healthcare professionals. An improvement in the overall quality and performance of Pakistan's pharmaceutical industry's supply chain will generally make it easier for medical and healthcare professionals to do their job. Drug-related treatment regimens are particularly common in medical and healthcare practice (Schouten

et al., 2011) and so a sufficient access to affordable drugs and pharmaceutical products can have a significant impact on the way these professionals do their jobs.

Medical and Healthcare Businesses and Organizations. Medical and healthcare businesses and organizations that would benefit from improvements in the performance of Pakistan's pharmaceutical industry include hospitals, clinics, medical centers, and the pharmaceutical firms that sell drugs, drug precursors, and other raw materials. By stimulating improvements in the country's pharmaceutical industry's supply chain performance, organizations like hospitals would be in a much better financial and operational position to fulfill their mandates to provide efficient, high quality, affordable, and accessible medical and healthcare services to those who need it, i.e. patients. From a purely financial perspective, they would be in a better position to cut their costs and magnify their bottom line, among other aspects of profitability.

Pakistan's pharmaceutical industry. By improving the pharmaceutical industry's supply chain performance in Pakistan, the industry that is going to benefit would naturally be the pharmaceutical industry. This can happen as a result of a complex interplay of factors, but in most cases, such outcomes can be attributed to more cost efficient and productive operations, which in turn leads to lower operating costs and therefore higher profit margins. The higher profit margins can then be used by the pharmaceutical industry firms to improve the quality of their products through research and development projects. By keeping the firms that power the country's pharmaceutical industry profitable, their long-term growth and development can be secured and sustained (Itami & Nishino, 2010).

Pakistan's Economy. The ultimate beneficiary of all the positive effects of an improved pharmaceutical industry supply chain performance would be Pakistan's economy. A healthy population (which is thanks to more optimized access to drugs and pharma products) would mean lower national health and medical services-related expenditures for the government (Warnecke et al., 2008). This can contribute significantly to the country's economic growth. A healthier and more profitable environment for businesses and organizations operating in the pharmaceutical industry would stimulate more investments, expansion, and job creation. Combined, these would create a snowballing effect that would contribute to the sustained growth of Pakistan's economy.

How the Pharmaceutical Industry Supply Chain Network Works

Pakistan's national pharmaceutical industry shows a lot of promise but there are a lot of steps that need to be taken in order for it to be truly competitive regional industry leader, and one of those steps is the liberalization and enhancement of its supply chain management performance (Usman, Raouf, Ahmad, & Sparks, 2009; Nadvi & Halder, 2005). There are more than six hundred companies that operate in Pakistan. The exact number is hard to determine because it tends to fluctuate with an upward bias from time to time. It is worthy to note that more than half of the pharmaceutical firms that have been established in the country are operating units (Usman, Raouf, Ahmad, & Sparks, 2009; Nadvi & Halder, 2005).

An operating unit is not a standalone pharmaceutical industry corporation like Pfizer, Johnson and Johnson, and GlaxoSmithKline (GSK). Rather, it is a larger part of a pharmaceutical production firm, which in turn, may just be one of the many components

of a pharmaceutical industry giant. An operating unit is the main functional component of the pharmaceutical industry's supply chain framework (Khan, 2012). In order to understand the role that an operating unit plays in the supply chain framework and the corresponding performance of pharmaceutical firms, one has to have a decent knowledge of the pharmaceutical manufacturing process. From a linear perspective, there are different processes involved in the industrial and mass production and synthesis of drugs and pharmaceutical products, each of which has to be fittingly integrated to ensure an optimum SCM performance (Shah, 2004).

Because of the complexity of the entire process and the sheer volume of materials that have to be transformed during the operation, a per unit type of operation has been developed. Under this type of scheme, each unit would be responsible for its own series of operations (Koh, Schuster, Chackrabarti, & Bellman, 2003). There are, for example, pharmaceutical operating units that take care of the milling, coating, granulation, dosage, and tablet pressing (among other methods of containment), and extrusion. Depending on the type of drug or pharmaceutical product that is being developed, certain operating units (each with its own specialty) can be added or removed from the supply chain framework. This is, of course, meant to optimize the entire process and to ensure that each operating unit would have an efficient level of utilization (Koh, Schuster, Chackrabarti, & Bellman, 2003).

The five types of operating units in the pharmaceutical industry are the following: pre-formulation development, formulation development, power blending, milling, granulation, and hot melt extrusion (Wilson, Williams, Jones, & Andrews, 2012). Focusing again on Pakistan, most of the pharmaceutical operating units in the country are

wholly or partially owned subsidiaries of international pharmaceutical firms (Khan, 2012). This is why the economic and geopolitical fluctuations in the country have severely affected the growth and expansion of the pharmaceutical industry. A significant change in the rate of inflation and foreign exchange rate and currency value would normally lead to supply chain disruptions because of the cost-related effects on the way the operating units get funding from and ship their outputs to their parent firms or other operating units for further processing (Dabney, 2016). In the end, this is going to have a significant effect on the companies' operating margins. Regardless of how prosperous the future of the pharmaceutical industry in Pakistan is, there is little to no choice that such a picture of the future would be realized, if even the smallest industry supply chain units (i.e. the unit operators) cannot generate a level of profit that is attractive enough for them to consider significantly expanding their operations (Khan, 2012).

The pharmaceutical industry in Pakistan is still changing. From a supply chain management perspective, the country is becoming more and more competent when it comes to establishing its own supply chain network in as far as pharmaceutical product development and manufacturing are concerned (Ali & Akram, 2012). This may be due to the fact that the country has learned a lot of lessons during the closing decade of the twentieth century. It can be recalled that during that time, the largest portion of Pakistan's pharmaceutical industry was controlled by multinational corporations. Nearly two decades later, the ratio between multinational corporations and Pakistani-owned and operated companies have dramatically changed. Of the numerous pharmaceutical operating units in the country, more than half (55%) are Pakistani owned and operated,

while slightly less than half (45%) are owned and operated by multinational corporations (Zaman, 2011).

This is a positive type of development because this means that the country is starting to get a bigger share of the thriving pharmaceutical industry; this can later be used as a leverage to encourage more pharmaceutical firms to be established and for existing ones to expand (Malik & Kotabe, 2009). In theory, that would lead to better prospects when it comes to government corporate tax revenue collection and job creation. A bigger local pharmaceutical industry is also going to create a boom in the establishment of new and existing pharmaceutical industry support firms (Ali & Akram, 2012). These support firms are generally businesses that are indirectly related to the pharmaceutical industry. Examples of these businesses would include those that supply the different components or raw materials that the individual pharmaceutical units use in their respective operations (Gunasekaran & Ngai, 2005). Pharmaceutical marketing and advertising firms could be included in this sector.

It is worth noting that all of these firms, regardless of whether they are directly or indirectly related to the process of manufacturing drugs and other pharmaceutical products, are still considered a part of the overall pharmaceutical industry supply chain framework. To be more specific, these support businesses serve as the upstream business partners of the actual firms that manufacture the drugs and pharmaceutical products that eventually get sold to the end users, e.g. patients with the target diseases (Giunipero & Eltantawy, 2004). From the perspective of the support businesses, on the other hand, the actual firms that manufacture the drugs and pharmaceutical products would serve as their

downstream customers in a typical business transaction where their clients are not the end users but industry-related businesses (Zaman, 2011).

In Pakistan, despite the improvements that were made and realized in the pharmaceutical industry, a lot of challenges are left unaddressed. For example, the local pharmaceutical industry can only supply around four-fifths percent of the total demand for drugs and other pharmaceutical products; the remaining twenty percent have to be imported from countries like China, the United States, Japan, and Europe (Zaman, 2011). Otherwise, there would be a deficit in the industry's supply chain, which is common among developing countries because they have no choice but to import the raw materials that they do not have access to or are not capable of producing (Sattar & Maqsood, 2003). This is a risk that can potentially lead to supply shortages of the end-user products (e.g. the drugs and pharma products) and so the country and the local industry cannot afford to scrimp on the imports. The process of importation, in itself, can still be considered a supply chain related process, only it is more complicated because an external source is being used to supply the local needs of Pakistan's pharmaceutical industry (Sattar & Maqsood, 2003).

One of the biggest challenges that Pakistan's Pharmaceutical Industry's supply chain framework still struggles to solve is the excessively high levels of government influence and in some cases, even total control, on the prices of pharmaceutical products, even those that are imported into the country by multinational corporations, which is also common in other industries and in other emerging countries (Fogel, 2006). This leads to the next major challenge on the country's pharmaceutical industry supply chain, the continuous reliance on imports of end products and raw and precursor materials.

This highlights the potentially negative impacts of high levels of inflation and foreign exchange rate fluctuations on the growth and stability of the pharmaceutical industry's supply chain. For example, the foreign exchange rate fluctuation, which is biased towards the devaluation of the Pakistani Rupee and against other major and heavily traded currencies makes it more expensive for local operating units (pharmaceutical firm subsidiaries) to import their raw materials and other precursors from China and other markets that are part of the industry's supply chain framework (Dabney, 2016). Although a continuously increasing percentage of the operating units in the pharmaceutical industry is being owned and operated by Pakistani nationals, this does not change the fact that they still have to import raw materials and precursors from foreign markets. This is because the upstream supply chain network in Pakistan for pharmaceutical products is still not well established (Zaman, 2011). It still relies on foreign imports. This, therefore, presents a major supply chain challenge that the government, ideally in partnership with the private sector, should address, but for some reason, it has not (Zaman, 2011).

Another major limitation to the continuous growth and expansion of the country's pharmaceutical industry is the increasing costs of drug production (Zaidi, Bigdeli, Aleem, & Rashidian, 2013). This may be due to the upward changes in wages, energy costs, Research and Development, and other variable expenses. In general, these changes make the idea of setting up a pharmaceutical firm or subsidiary in Pakistan less attractive (Zaidi, Bigdeli, Aleem, & Rashidian, 2013).

Perhaps the biggest challenge that the nationwide pharmaceutical industry is facing is the lack of sufficient initiatives that is aimed at improving the pharmaceutical

firms' access to the local and international markets (Khalique, Shaari, Abdul, Isa, & Ageel, 2012). Based on the nature of this challenge, this is essentially a supply chain management related problem. So far, the pharmaceutical operating units in Pakistan are engaged in pre-contracted deals with their parent companies. This means that the only pharmaceutical industry participants that are being attracted to set up shop in Pakistan are those that already have a connection with other local and multinational firms (Shabbir, n.d.).

Pharmaceutical startups are fairly rare in the country; if there are any, very few succeed in generating profits because of the highly restrictive business environment for pharmaceutical firms, especially the smaller ones (Shabbir, n.d.). This can again be attributed to the fact that the individual components or clusters within the pharmaceutical industry's supply chain framework are not well integrated. This, in theory, makes it hard for a company who wants to address the supply deficits and gaps in a certain aspect of drug manufacturing (e.g. pre-formulation and formulation drug requirements, among others) to supply other businesses because of the lack of linearity and standardization in the process (Wilson, Williams, Jones, & Andrews, 2012).

This challenge in Pakistan's pharmaceutical industry's supply chain framework may also be attributed to the political instability and continuously deteriorating law and order situation in the country. Markets and the customers in those markets are rarely willing to have unrestricted access to trade and other transactions that involve sales if the political, social, and economic environments are not conducive enough (Fogel, 2006). Pakistanis lagging in terms of the establishment of an orderly government and a social and economic environment where pharmaceutical firms can thrive by having complete

and unimpeded access to both the local and international markets for their output products. This applies to all four types of drug manufacturing companies (based on the diverse types of drug manufacturing licenses available) that operate in the country: formulation, basic manufacturing, semi-basic manufacturing, and repacking. In almost all cases, the problems that these four types of pharmaceutical firms encounter in Pakistan can be addressed by an unimpeded and a higher level of market access. In a study published in the International Journal of Business and Information Technology (2011), a group of researchers suggested that a new wave of information technology-based marketing and supply chain management strategies could significantly help address the problematic Pakistani pharmaceutical industry situation. Some examples of the interventions that was proposed in that study include the use of digital media and electronic commerce, more intensive studies and understanding of consumer behavior, and an increase in the level of focus on highly specialized drugs (Aamir & Zaman, 2011).

The Global Pharmaceutical Industry

The global pharmaceutical industry is perhaps one of the most complex and research-intensive industries. This is because innovation has long served as the backbone and the foundation that has been powering up this industry (Dunlap, Kotabe, & Mudambi, 2010). Some of the most common examples of companies and firms that operate in the pharmaceutical industry include independent drug and drug services research and development firms, drug manufacturers, and developers of medical and healthcare devices. The goal of the pharmaceutical industry, at large, is to lead the discovery, development, production, and marketing processes in relation to drugs and other products that can be used as and for medication (Kolb & Sharpless, 2003). It is

worth noting that while the pharmaceutical industry has its own internal checking and balancing measures, it is still subject to the often harsh scrutiny of the government regulatory agencies. This is the case since faulty and improperly monitored and regulated drugs, medications, and other pharmaceutical products, just like food, can have an adverse effect on the health of entire populations. Such types of adverse effects, as a result of policy miscalculations, can lead to the generation of unnecessary costs for the government (Dunlap, Kotabe, & Mudambi, 2010). Mishaps in the pharmaceutical industry are not that uncommon and so far, the government, especially those that are in developing countries, have already learned their lesson about the importance of subjecting the pharmaceutical industry to heavy scrutiny. This is the main reason that it is now subject to a highly diverse set of regulations, laws, and policies. Some of the processes that government agencies, departments, and authorities tend to pay particular attention to include patenting, new drug development, testing, licensing, and marketing (Dunlap, Kotabe, & Mudambi, 2010).

There are numerous ways in which drugs and other pharmaceutical products can be allowed or not allowed to enter the market. A review of the recent trends would show that the regulations which the pharmaceutical firms and the broader pharmaceutical industry face are increasing both in terms of number and individual complexity. This can be considered as a double-edged sword, mainly because it (the trend) can affect both the very people that the laws and regulations are trying to protect and the organizations that it is trying to restrict, both in positive and negative ways (Guler & Nerkar, 2012). As an example, pharmaceutical firms get positively affected by the heavy regulation schemes being implemented by the government because it practically forces them to innovate and

remain competitive; the people who are the target consumers of a newly developed drugs, on the other hand, would benefit from the access to safe, effective, and affordable drugs for medication purposes. Focusing on the negative side, on the other hand, the increasing level of laws and regulations that the government imposes on pharmaceutical firms makes it harder for companies that develop drugs and medical devices to provide much-needed products and services for people who need it (Guler & Nerkar, 2012). Patients with medical conditions that are harder to treat, for example, would find it more difficult to procure needed medicines because of the difficulty of the companies that are developing the drugs and medical devices to be granted the access to their target markets. From an economic perspective, this creates a deficit situation where the population of people whose medical and healthcare needs fail to be satisfied significantly increases. This only goes to show that the process of regulating the pharmaceutical industry can work both ways (Itami & Nishino, 2010).

Key Processes Involved in the Pharmaceutical Industry's Supply Chain Framework

Drugs can easily be identified as the staple products being offered by firms operating in the pharmaceutical industry. Drugs share both homogeneous and heterogeneous economic qualities in that all types of drugs can be considered drugs but not all drugs are of the same type. Every few years, more types and classes of drugs are being discovered. After being discovered, it only takes a short period of time before they can be fully developed and released into the market, depending on the applicable regulatory frameworks and the actual need or demand for the product. Focusing on the marketing of new drugs, there are two key requisite processes that likely all

pharmaceutical industry firms have to go through, drug discovery and drug development (Shabbir, n.d.).

To be able to answer the questions that are related to the supply chain management framework performance in the pharmaceutical industry in Pakistan, it is important to have a solid understanding of the different processes involved in the delivery of pharmaceutical products (e.g. drugs) to consumers, ideally from the start to end (Zaidi, Bigdeli, Aleem, & Rashidian, 2013). In most cases, it starts from the first phases of drug discovery, where a lead compound gets generated or discovered, and ends with the last stage of the drug development process, where marketing applications for various countries and manufacturers get the approval they need in order to be cleared for actual selling (Koh, Schuster, Chackrabarti, & Bellman, 2003).

In a study that was published in the International Journal of Pharmaceutical and Healthcare Marketing, a group of researchers examined the possibility of developing and implementing a service quality scale that could measure the service quality of an entire pharmaceutical industry supply chain framework (Ahmad, Usman, Raouf, & Sparks, 2009). In order to do this, the researchers studied the cases of 413 pharmaceutical retailers working in two of the biggest cities in Pakistan. What they came up with was a ten-item survey scale that focuses on four supply chain performance dimensions primarily for the pharmaceutical industry. The goal, of course, was to ensure that the questionnaire that would be created based on the model that they developed would not only be valid but, also reliable. Based on the study that they conducted, tangibility, reliability, responsiveness, adaptability, assurance, and empathy, are among the most important variables. In the end, they concluded that despite the abundance of studies that

suggest a diverse combination of dimensions or variables that can be incorporated in the process of evaluating supply chain management performance, there should not be a strictly universal set of dimensions and or items that can be used to determine service quality across a section of service industries, or in this case, the supply chain performance of a target country's (Pakistan) pharmaceutical industry. This implies that a truly effective and appropriate supply chain management performance method is one that uses a flexible or dynamic set of variables (or dimensions) instead of a rigid one (Ahmad, Usman, Raouf, & Sparks, 2009). This, in theory, should enable the person, group, or organization conducting the supply chain performance evaluation process to test a certain industry's supply chain framework's performance based on the variables or dimensions that truly matter because it is the appropriate step to take and not just because it had been included in some standardized evaluation method or questionnaire (Shah, 2004). Above mentioned argument or finding coincides with what other previously published literature about the creation of a unified way to evaluate supply chain management performance in relation to the pharmaceutical industry.

Drug Discovery

Drug discovery refers to the process by which drugs that have the potential to cure a still incurable disease or to cure an already curable one, but in a more effective and or efficient manner, get designed or discovered (Dunlap, Kotabe, & Mudambi, 2010). Traditionally, drug discovery processes have worked by merely enabling the scientists to isolate the active components of an ingredient or any drug raw materials and use it to scale up or intensify the effects of certain traditional remedies. This traditional model of drug discovery has worked for many years. It has also enabled the still growing

pharmaceutical industry to establish a strong understanding of how drug ingredients and raw materials and their active components can be studied, isolated, and crafted for safe and effective human consumption (Guler & Nerkar, 2012). This paved the way for a more modern and theoretically more efficient and effective way of discovering new drugs. Instead of just focusing on the progress made by the material understanding of drugs, modern pharmaceutical and biotechnology firms use their updated understanding of how the body works. At this point, there is also the accumulation of concepts that are derived from other fields (Kolb & Sharpless, 2003). There are, for example, components of biotechnology, anatomy, physiology, and pharmacology, and pharmacokinetics. One strategy that modern drug discovery and development firms use is that they focus on using their understanding of the different metabolic pathways of the body and how they work in relation to the drugs and the collection of active ingredients that they introduce. This way, they can study and therefore module the target patients' responses from both sides, both from the side where they revise the components of the drug that is being conceptualized, and the side where they revise the effects of the drug's plasticity in as far as the nature and the structure of the target metabolic pathways are concerned (Wilson, Williams, Jones, & Andrews, 2012). This more contemporary process of drug discovery essentially allows pharmaceutical firms to develop more efficient products, ones that are slightly less potent but can still create the same effects as their more powerful counterparts. This is made possible by the process that lets them target certain metabolic pathways and take advantage of other naturally occurring metabolic mechanisms to deliver the drug payload faster and achieve higher absorption and bioavailability rates, among other metrics and metric-related improvements (Schouten et al., 2011).

Despite the already significant impact of this contemporary method of discovering new drugs that can be introduced into a variety of markets, new and more updated methods of drug discovery are still being developed. One of the most prominent of which is click chemistry. In a study that was featured in Drug Discovery Today, a group of researchers examined how click chemistry is changing the drug discovery landscape (Kolb & Sharpless, 2003). In the said study, they defined the parameters that can be used to correctly identify when a pharmaceutical firm or any pharmaceutical industry participant is using click chemistry to reach its organizational goals and objectives. Kolb & Sharpless (2003) define click chemistry as a modular approach that makes use of the most practical, efficient, and reliable means of chemical transformation. The importance of optimizing these functions cannot be understated because they serve as the backbone of the modern drug discovery process. Its applications can be found in all aspects of drug discovery such as lead generation using combinatorial chemistry and template-based and targeted in situ chemistry, DNA research, proteomics, and the study and use of bio-conjugation reactions (Kolb & Sharpless, 2003). It is important to note that a typical drug lead discovery process is laborious in that it takes a lot of time, effort, and resources from the company that is spearheading the operations. With click chemistry, the goal is not to completely replace the other existing drug discovery methods but to simply complement and extend their reaches. In the case of the Copper-I-catalyzed 1, 2, 3-Triazole formation from terminal acetylenes and azides that was the subject of Kolb & Sharpless' (2003) study, for example, their goal of using click chemistry was to simply optimize the process by understanding more about the associations between the chemically transformed compounds and ingredients and their biological targets, i.e. how the specific body

systems, organs, and or cells would react when the said agents get introduced (Wilson, Williams, Jones, & Andrews, 2012).

Despite the already numerous developments in the process of drug discovery and the finite number of compounds that can be used for eventual drug development programs, the pharmaceutical firms' ability to discover new drugs is still fairly limited. One of the hindrances that was identified in previously published studies is the slow and complex synthesis technique used to discover and develop natural products, or what is also referred to in the pharmaceutical industry as compound synthesis (Guler & Nerkar, 2012). Click chemistry relies on the use of a highly selective, discriminative, and as a result, near-perfect method of synthesizing compounds. Some of the common requirements in a click chemistry- based drug discovery process include the use of a wide scope (so that a larger pool of drug-related compounds can be discovered and regenerated, i.e. higher yields for and varieties of starting materials), and the selection of processes that are easy to perform, insensitive to water and oxygen, and only makes use of readily available reagents, and whose reaction work-up and product isolation processes do not require chromatographic purification (Kolb & Sharpless, 2003). Without going much into the technical details, the emergence of click chemistry serves as concrete evidence that the drug discovery landscape in the pharmaceutical industry is still being continuously developed and this can be considered a positive type of development. This means that there will be potentially more marketable pharmaceutical products in the future and more patients will be able to benefit from such products and the relief (from medical and physical conditions) that they offer (Guler & Nerkar, 2012). Focusing on the supply chain management performance side, however, this will also mean greater

constraints and a higher demand for more optimized supply chain management practices. As the pharmaceutical grows in size and complexity, so should its underlying supply chain management framework. Otherwise, the supply chain performance can be a potential issue, a bottleneck even, that may hamper the otherwise healthy growth and expansion of the pharmaceutical industry (Schouten et al., 2011).

Drug Development

Drug development is another major procedural component being undertaken by pharmaceutical firms. This procedure often succeeds the completion of the drug discovery process. When a drug has been successfully discovered, the newly discovered compound would already be considered as a potentially marketable product (Dunlap, Kotabe, & Mudambi, 2010). However, it would still be subject to various processes before the newly discovered compound would be allowed to be sold to prospective consumers. This is where the numerous subcomponents of the drug development phase would come in. The drug development phase refers to the collection of processes done to more formally establish the suitability of the newly discovered compound as a medication (Wilson, Williams, Jones, & Andrews, 2012). Some of the key objectives of a pharmaceutical firm that is conducting drug development operations include the determination of appropriate formulation, dosing, list of indications, contraindications, and precautions, and establishing supply chain related components such as what types of synthetic and natural raw materials to use and where to source them from (Wilson, Williams, Jones, & Andrews, 2012). This is the area in which a pharmaceutical firm who wants to introduce a new brand or product to the market files a new drug or pharmaceutical product application before a certain country's drug regulatory agency and

begins to conduct a complex combination of in vitro studies, in vivo studies, and large scale clinical trials (Guler & Nerkar, 2012). Each of these drug development components is divided into various sub-components. The clinical phase, which is arguably the most important, for example, can be divided into four sub-phases, namely Phase I, II, III, and IV. Across all phases, the targets are not animals anymore but actual human subjects (Wilson, Williams, Jones, & Andrews, 2012). Under Phase I, healthy human volunteers are the ones that get recruited; the main goal of which is to establish a safety and dosing protocol for the drug that will be marketed. Phase II clinical trials are a little bit different in that they are used to conduct an initial evaluation of the efficacy of the product being tested, focusing on a small population of non-healthy patients, particularly those who have the disease that is being targeted (Dunlap, Kotabe, & Mudambi, 2010). Phase III clinical trials are essentially the same as Phase II; the only difference is that the population size of the patients who have the disease that is being targeted would normally be significantly larger. Phase IV clinical trials are the least intensive but most extensive, at least in theory. This is because the fourth phase is where market surveillance studies and other post-approval trials based on the drug regulatory agency's requirements will normally be conducted. It is important to note that the progression of the clinical trial phases is sequential and not simultaneous; that is, the drug development process cannot proceed to the next stage or phase without completing the first one (Schouten et al., 2011).

There have also been numerous developments in the drug development side of the pharmaceutical industry that are aimed at modernizing and optimizing the way by which new drugs and other pharmaceutical products get developed. In the drug development-

related operational advancements with supply chain management and performance-related implications, one development that is worth discussing is vertical product (i.e. drug) development integration (Dunlap, Kotabe, & Mudambi, 2010).

Pakistan's Pharmaceutical Industry in relation to the Global Pharmaceutical Industry

The pharmaceutical firms that are operating in the country are not full-blown ones like Abbott, Merck, and GlaxoSmithKline. The majority of the pharmaceutical industry firms that are doing business in the country are merely operating units (Khan, 2012). Operating units can either be a partially or wholly owned overseas subsidiary of a multinational corporation, i.e. a pharmaceutical industry giant, or a locally owned business venture that supplies active drug ingredients and other precursors to the companies that are in charge of manufacturing and distributing the final output to the consumers; these are the drugs and the pharmaceutical products that have been manufactured using the active drug ingredients and precursors supplied by the pharmaceutical firms in Pakistan (Zaman, 2011). This means that on a global scale, Pakistan's pharmaceutical industry serves as the producer of raw materials that the actual drug manufacturers, companies located overseas, use to produce their final outputs. It is a problem because in a typical supply chain environment, the further up one goes in the hierarchy of producers, the thinner the profit margin becomes. This is why the companies and countries that are in charge of supplying raw materials needed for the drug manufacturers to produce drugs and other pharma products are the ones that have the lowest earnings (Khan, 2012). The drug manufacturers, whose main role is to assemble the raw materials (i.e. active drug ingredients and precursors, among other components

that are essential to the manufacturing process) coming from the operating units in countries like Pakistan, on the other hand, earn the highest. Although the difference is normal, it is considered a problem because this can be interpreted as an indicator that the government as represented by the policymakers and the members of the private sector are not doing enough to ensure and secure the long-term growth and sustainability of the pharmaceutical industry and its underlying supply chain network (Ramanathan, 2009). For Pakistan's pharmaceutical industry's supply chain network to truly grow, it needs to go down the ladder and evolve from being just a raw material, active drug ingredients, and drug precursor's supplier to being a full-blown drug manufacturer. The problem with this goal is that there are many malpractices within Pakistan's pharmaceutical industry's supply chain that lead to inefficiencies and low quality of output. These ultimately create an environment that is hostile to the long-term growth and development of the pharmaceutical industry.

Methodology

The goal of this study was to examine the supply chain management performance of the pharmaceutical industry in Pakistan as perceived by industry professionals in Pakistan. Data was collected through questionnaires that would facilitate quick analysis and interpretation of information gathered. The questions were administered to a selected sample of the participants that represent every sector of the industry including the multinationals, local manufacturers, retailers, and regulators. The results of the study suggested that the manufacturers are not managing lead-time properly due to factors such as government regulations, manufacturers lack consistency in terms of Supply Chain Flexibility/Agility Performance, Supply Chain Resource Performance, and Supply Chain Output Performance. These were the three metrics that were used to describe the independent variable which is the supply chain performance of Pakistan's pharmaceutical industry.

Participants and Data Sets

The study focused on the main participants in the pharmaceutical manufacturing sectors in the country. As such, the respondents were composed of managers, marketers, pharmaceutical retail outlets, and independent distributors. Through the questionnaires, the respondents provided information that measures various aspects of SCM. The sample size was 60. This included managers of pharmaceutical firms and companies, including but not limited to manufacturers, wholesalers, and retailers, and basically any company that can be identified as a stakeholder in Pakistan's pharmaceutical industry's supply chain framework.

The manufacturers, wholesalers, and retailers, and basically any company that can be identified as a stakeholder in Pakistan's pharmaceutical industry's supply chain framework were selected as the sample population because their opinions and perceptions could be used as not only an adequate but also a reliable representation of the opinions and perceptions of the entire Pakistani pharmaceutical industry's supply chain. Upon closer analysis, one would find that these individuals belong to the Pakistani pharmaceutical industry's supply chain network. The manufacturers are those producing the product; the wholesalers and retailers act as their distributors. The key requirement here was that they should be fundamentally identified as a stakeholder, meaning they had vested interests in the pharmaceutical industry of Pakistan's supply chain framework.

In order to meet the target sample population size of 60 Pakistani pharmaceutical firm employees, a combination of various sampling techniques and procedures was used by the research team. There was a total of two independent sampling techniques, convenience sampling and snowball sampling, both of which are non-probability types of sampling. Convenience sampling is where the research team recruit and shortlist respondents based on the two parties' availability (that of the researchers and the target respondents) (Zaman, 2011). The rationale behind the use of convenience sampling was to be able to save time and maximize the efficiency of the research's implementation phase. The convenience sampling technique was used to recruit the first few respondents. After recruiting the first few respondents, the snowball sampling technique was used. This is where the already recruited respondents recruit their friends, colleagues, and acquaintances who are working in the same field. They will be referred to the researchers so that they may also be included in the list of prospective respondents, hence the term

snowballing (Ramanathan, 2009). The rationale behind the use of this sampling technique was convenience and efficiency. It is important to note, however, that a set of inclusion criteria was still used to screen the respondents. The goal of which was to make sure that all of the 60 respondents were an appropriate representative of the target population whose perceptions about the supply chain performance of Pakistan's pharmaceutical industry was examined. The most important qualification was that the respondents should be an employee of a pharmaceutical firm that is based in Pakistan; a respondent should have at least a 4 year working experience in the field and at least a 2 year tenure working as an employee of his or her current company. Respondents with less than 1 year experience would be included based on the level of education completed. In order to minimize the effects of other non-Supply Chain Management related variables on the outcome of the data analysis, there was an equal division of the total sample population in terms of gender. Information was not collected in terms of culture, social class and status, and the hierarchy of company position.

Data Collection, Instruments, and Procedures

A custom questionnaire featured in a Malaysian doctoral dissertation that was also aimed at examining the performance of an industry's underlying supply chain management practices was used as the main research instrument in this study. It used a 7 Point Likert Scale type of question. It measured the target industry's Supply Chain Performance based on numerous dimensions, namely Supply Chain Management Practices, Supply Chain Integration, the actual Supply Chain Performance, and Demographic Profiles (Pandiyan, n.d.). Because this paper only focused on SCM

performance, the third dimension that was featured in the said questionnaire, which is on the actual Supply Chain Performance was the focus.

Method of Data Analysis

The online survey gathering primary information used the questionnaire which was sent through email via contacting the participant through email or telephone in the field that was referenced earlier. The goal of which was to examine how the respondents rate the supply chain performance of Pakistan's pharmaceutical industry using a 7 point Likert Scale. Using the assumption that was presented earlier, the respondent's perceptions were an accurate predictor of the actual performance of Pakistan's pharmaceutical industry's supply chain framework.

The data analysis phase succeeded the data gathering and other phases included in the implementation proper of the study. The data analysis focused on the use of descriptive statistics. Descriptive statistics were used to present a summary of what the respondents suggested in relation to the performance of Pakistan's pharmaceutical industry's supply chain. Since a 7 Point Likert Scale was used, a quantitative representation of the data was used. Based on how the questionnaire was presented, the mean or average score for each questionnaire item, questionnaire dimension, and eventually the entire questionnaire was obtained. The closer to 7 (which is the maximum positive score) the average score was, the more positive it was. The lowest possible score was 1; a score of 1, in this case, meant that the average perception of the respondents regarding the SCM performance of the industry being examined was extremely negative.

Results and Findings

The results and findings of the study were summarized using the set of tables below. The case processing summary table below shows that there was a perfect response rate in all questionnaire items. This can be evidenced by the N, total number of responses, in the table's second column.

Table 1

Case Processing Summary

	Cases					
	Included		Excluded		Total	
Questions	N	Percent	N	Percent	N	Percent
D1	60	100.0%	0	0.0%	60	100.0%
D2	60	100.0%	0	0.0%	60	100.0%
D3	60	100.0%	0	0.0%	60	100.0%
D4	60	100.0%	0	0.0%	60	100.0%
SC1	60	100.0%	0	0.0%	60	100.0%
SC2	60	100.0%	0	0.0%	60	100.0%
SC3	60	100.0%	0	0.0%	60	100.0%
SC4	60	100.0%	0	0.0%	60	100.0%
SC5	60	100.0%	0	0.0%	60	100.0%
RP1	60	100.0%	0	0.0%	60	100.0%
RP2	60	100.0%	0	0.0%	60	100.0%
RP3	60	100.0%	0	0.0%	60	100.0%
RP4	60	100.0%	0	0.0%	60	100.0%
RP5	60	100.0%	0	0.0%	60	100.0%
OP1	60	100.0%	0	0.0%	60	100.0%
OP2	60	100.0%	0	0.0%	60	100.0%
OP3	60	100.0%	0	0.0%	60	100.0%
OP4	60	100.0%	0	0.0%	60	100.0%
OP5	60	100.0%	0	0.0%	60	100.0%
OP6	60	100.0%	0	0.0%	60	100.0%
OP7	60	100.0%	0	0.0%	60	100.0%

Note. Limited to first 60 cases.

Table 2

Demographics

Case Processing Summary

Questions	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
D1	60	100.0%	0	0.0%	60	100.0%
D2	60	100.0%	0	0.0%	60	100.0%
D3	60	100.0%	0	0.0%	60	100.0%
D4	60	100.0%	0	0.0%	60	100.0%

Note. Limited to first 60 cases.

The case summary for the Demographic Profile of the respondents shows that in terms of the size of the organization, pharmaceutical firms composed of less than 50 and more than 500 employees were the most represented; each had a 23% allocation. In terms of revenues, the Pakistani pharmaceutical firms with revenues between 1 to 5 Million were the most frequently surveyed; they represented 23% of the respondent population. This was closely followed by Pakistani pharmaceutical firms with revenues between 50 to 100 Million; they represented 21.7% of the respondent population. In terms of the respondents' total years of experience working for their current company, those with between 5 to 10 years of experience were the largest part of the population at 21.7%. In terms of their highest educational attainment, those with only a Technical / Vocational Education were the largest part of the population, representing 21.7%.

Table 3

Demographics Case Summaries

Cases Summaries				
Case N	D1	D2	D3	D4
1	More than 500	50 to 100 Million	1 to 5 years	Technical or Vocational Education
2	100 to 250	1 to 5 Million	5 to 10 Years	Technical or Vocational Education
3	More than 500	5 to 10 Million	10 to 15 Years	Secondary School
4	50 to 100	More than 100 Million	10 to 15 Years	Ph.D./Doctorate Degree
5	More than 500	1 to 5 Million	15 to 20 Years	Intermediate Higher Secondary School
6	250 to 500	Less than 1 Million	More than 20 Years	Ph.D./Doctorate Degree
7	More than 500	10 to 50 Million	15 to 20 Years	Ph.D./Doctorate Degree
8	100 to 250	Less than 1 Million	Less than 1 Year	Intermediate Higher Secondary School
9	More than 500	More than 100 Million	5 to 10 Years	Technical or Vocational Education
10	50 to 100	5 to 10 Million	10 to 15 Years	Ph.D./Doctorate Degree
11	250 to 500	50 to 100 Million	10 to 15 Years	Secondary School
12	50 to 100	50 to 100 Million	15 to 20 Years	Intermediate Higher Secondary School
13	Less Than 50	Less than 1 Million	Less than 1 Year	Intermediate Higher Secondary School
14	50 to 100	5 to 10 Million	More than 20 Years	Ph.D./Doctorate Degree
15	Less Than 50	1 to 5 Million	5 to 10 Years	Technical or Vocational Education
16	Less Than 50	1 to 5 Million	10 to 15 Years	Master's Degree

Cases Summaries

Case N	D1	D2	D3	D4
17	50 to 100	50 to 100 Million	5 to 10 Years	Intermediate Higher Secondary School
18	100 to 250	5 to 10 Million	5 to 10 Years	Technical or Vocational Education
19	Less Than 50	More than 100 Million	10 to 15 Years	Intermediate Higher Secondary School
20	100 to 250	10 to 50 Million	1 to 5 Years	Intermediate Higher Secondary School
21	250 to 500	5 to 10 Million	15 to 20 Years	Master's Degree
22	100 to 250	More than 100 Million	10 to 15 Years	Bachelor's Degree
23	More than 500	10 to 50 Million	15 to 20 Years	Technical or Vocational Education
24	More than 500	More than 100 Million	5 to 10 Years	Secondary School
25	250 to 500	1 to 5 Million	10 to 15 Years	Master's Degree
26	50 to 100	10 to 50 Million	More than 20 Years	Secondary School
27	100 to 250	1 to 5 Million	15 to 20 Years	Technical or Vocational Education
28	Less Than 50	1 to 5 Million	Less than 1 Year	Ph.D./Doctorate Degree
29	Less Than 50	Less than 1 Million	5 to 10 Years	Technical or Vocational Education
30	100 to 250	50 to 100 Million	Less than 1 Year	Ph.D./Doctorate Degree
31	Less Than 50	1 to 5 Million	5 to 10 Years	Ph.D./Doctorate Degree
32	100 to 250	More than 100 Million	1 to 5 Years	Bachelor's Degree
33	250 to 500	1 to 5 Million	Less than 1 Year	Bachelor's Degree
34	More than 500	10 to 50 Million	1 to 5 Years	Bachelor's Degree

Cases Summaries

Case N	D1	D2	D3	D4
35	More than 500	Less than 1 Million	10 to 15 Years	Technical or Vocational Education
36	250 to 500	More than 100 Million	15 to 20 Years	Master's Degree
37	250 to 500	Less than 1 Million	15 to 20 Years	Bachelor's Degree
38	More than 500	5 to 10 Million	1 to 5 Years	Technical or Vocational Education
39	Less Than 50	10 to 50 Million	5 to 10 Years	Technical or Vocational Education
40	250 to 500	50 to 100 Million	1 to 5 Years	Master's Degree
41	50 to 100	More than 100 Million	More than 20 Years	Intermediate Higher Secondary School
42	Less Than 50	50 to 100 Million	Less than 1 Year	Secondary School
43	Less Than 50	Less than 1 Million	5 to 10 Years	Master's Degree
44	100 to 250	Less than 1 Million	5 to 10 Years	Secondary School
45	250 to 500	50 to 100 Million	5 to 10 Years	Master's Degree
46	100 to 250	10 to 50 Million	More than 20 Years	Intermediate Higher Secondary School
47	50 to 100	1 to 5 Million	Less than 1 Year	Technical or Vocational Education
48	Less Than 50	1 to 5 Million	More than 20 Years	Ph.D./Doctorate Degree
49	100 to 250	1 to 5 Million	Less than 1 Year	Secondary School
50	100 to 250	50 to 100 Million	Less than 1 Year	Secondary School
51	Less Than 50	5 to 10 Million	5 to 10 Years	Master's Degree
52	250 to 500	50 to 100 Million	10 to 15 Years	Ph.D./Doctorate Degree

Cases Summaries

Case N	D1	D2	D3	D4
53	Less Than 50	50 to 100 Million	1 to 5 Years	Master's Degree
54	More than 500	More than 100 Million	10 to 15 Years	Master's Degree
55	250 to 500	5 to 10 Million	More than 20 Years	Intermediate Higher Secondary School
56	250 to 500	1 to 5 Million	15 to 20 Years	Bachelor's Degree
57	Less Than 50	50 to 100 Million	More than 20 Years	Technical or Vocational Education
58	More than 500	Less than 1 Million	10 to 15 Years	Ph.D./Doctorate Degree
59	More than 500	1 to 5 Million	15 to 20 Years	Secondary School
60	More than 500	50 to 100 Million	Less than 1 Year	Bachelor's Degree
Total N	60	60	60	60
Mean	3.07	3.47	3.48	3.53
Median	3.00	3.00	3.50	3.00
GR.MED	3.17	3.40	3.52	3.45
MIN	Less Than 50	Less than 1 Million	Less than 1 Year	Secondary School
MAX	More than 500	More than 100 Million	More than 20 Years	Ph.D./Doctorate Degree
STDEV	1.494	1.732	1.631	1.722

Note. Limited to first 60 cases.

Table 4

Supply Chain Flexibility Performance

Case Processing Summary

Questions	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
SC1	60	100.0%	0	0.0%	60	100.0%
SC2	60	100.0%	0	0.0%	60	100.0%
SC3	60	100.0%	0	0.0%	60	100.0%
SC4	60	100.0%	0	0.0%	60	100.0%
SC5	60	100.0%	0	0.0%	60	100.0%

Note. Limited to first 60 cases.

This discussion about the supply chain flexibility or agility performance-related findings focused on the overall score for each subgroup. Because a 7 Point Likert Scale was used, the performance for each cluster can be measured using any number between 1 and 7, with 1 being the lowest possible score and 7 being the highest. For the entire supply chain flexibility or agility performance group of questions, the overall score was 4.18. This represents a neutral score, neither positive nor negative. The computed means of every questionnaire item was provided at the end of results and findings.

Table 5

Supply Chain Flexibility Case Summaries

Case Summaries					
Case N	SC1	SC2	SC3	SC4	SC5
1	Very Negative	Satisfactory	Very Satisfactory	Excellent	Satisfactory
2	Neutral	Very Satisfactory	Very Negative	Very Negative	Negative
3	Very Negative	Neutral	Neutral	Excellent	Very Satisfactory
4	Negative	Satisfactory	Very Satisfactory	Very Satisfactory	Neutral
5	Neutral	Excellent	Very Negative	Slightly Negative	Negative
6	Neutral	Satisfactory	Negative	Very Satisfactory	Satisfactory
7	Negative	Satisfactory	Neutral	Satisfactory	Satisfactory
8	Satisfactory	Neutral	Satisfactory	Very Satisfactory	Excellent
9	Very Satisfactory	Negative	Satisfactory	Neutral	Excellent
10	Very Satisfactory	Excellent	Neutral	Excellent	Satisfactory
11	Very Satisfactory	Very Negative	Very Negative	Neutral	Very Negative
12	Negative	Excellent	Negative	Excellent	Neutral
13	Very Negative	Negative	Excellent	Satisfactory	Satisfactory
14	Excellent	Slightly Negative	Satisfactory	Very Negative	Very Negative
15	Slightly Negative	Neutral	Neutral	Very Negative	Very Satisfactory
16	Very Negative	Excellent	Excellent	Neutral	Excellent

Case Summaries

Case N	SC1	SC2	SC3	SC4	SC5
17	Very Negative	Very Negative	Neutral	Very Negative	Slightly Negative
18	Excellent	Neutral	Negative	Very Negative	Very Negative
19	Very Satisfactory	Very Negative	Very Satisfactory	Slightly Negative	Excellent
20	Excellent	Negative	Negative	Negative	Very Satisfactory
21	Very Negative	Very Negative	Very Satisfactory	Very Negative	Very Negative
22	Very Satisfactory	Neutral	Satisfactory	Slightly Negative	Slightly Negative
23	Negative	Satisfactory	Very Satisfactory	Very Satisfactory	Very Negative
24	Very Satisfactory	Excellent	Slightly Negative	Very Negative	Excellent
25	Satisfactory	Very Negative	Very Satisfactory	Slightly Negative	Satisfactory
26	Very Satisfactory	Slightly Negative	Negative	Slightly Negative	Satisfactory
27	Excellent	Very Negative	Neutral	Very Satisfactory	Very Negative
28	Very Negative	Slightly Negative	Excellent	Satisfactory	Excellent
29	Very Satisfactory	Satisfactory	Neutral	Very Satisfactory	Negative
30	Excellent	Very Satisfactory	Excellent	Negative	Very Satisfactory
31	Excellent	Excellent	Very Negative	Satisfactory	Neutral
32	Slightly Negative	Satisfactory	Very Satisfactory	Negative	Very Satisfactory
33	Negative	Excellent	Slightly Negative	Satisfactory	Satisfactory
34	Excellent	Very Negative	Slightly Negative	Very Negative	Neutral

Case Summaries

Case N	SC1	SC2	SC3	SC4	SC5
35	Satisfactory	Satisfactory	Very Satisfactory	Slightly Negative	Negative
36	Negative	Very Satisfactory	Excellent	Excellent	Excellent
37	Very Satisfactory	Satisfactory	Neutral	Neutral	Excellent
38	Satisfactory	Very Satisfactory	Very Satisfactory	Very Negative	Satisfactory
39	Very Satisfactory	Slightly Negative	Very Satisfactory	Very Negative	Negative
40	Very Negative	Very Satisfactory	Neutral	Negative	Excellent
41	Excellent	Slightly Negative	Neutral	Excellent	Negative
42	Negative	Very Satisfactory	Negative	Very Satisfactory	Excellent
43	Negative	Very Negative	Satisfactory	Excellent	Neutral
44	Excellent	Slightly Negative	Very Satisfactory	Excellent	Very Negative
45	Negative	Neutral	Negative	Neutral	Excellent
46	Neutral	Slightly Negative	Very Negative	Neutral	Excellent
47	Satisfactory	Very Negative	Very Satisfactory	Neutral	Neutral
48	Satisfactory	Excellent	Excellent	Satisfactory	Very Satisfactory
49	Negative	Negative	Slightly Negative	Neutral	Satisfactory
50	Excellent	Slightly Negative	Slightly Negative	Neutral	Excellent
51	Negative	Satisfactory	Very Negative	Satisfactory	Very Negative
52	Neutral	Satisfactory	Very Satisfactory	Excellent	Excellent

Case Summaries

Case N	SC1	SC2	SC3	SC4	SC5
53	Negative	Neutral	Excellent	Excellent	Negative
54	Neutral	Neutral	Very Satisfactory	Slightly Negative	Satisfactory
55	Excellent	Negative	Satisfactory	Slightly Negative	Very Satisfactory
56	Neutral	Neutral	Very Negative	Slightly Negative	Neutral
57	Satisfactory	Satisfactory	Slightly Negative	Excellent	Satisfactory
58	Negative	Slightly Negative	Neutral	Negative	Neutral
59	Very Satisfactory	Very Satisfactory	Excellent	Very Negative	Negative
60	Excellent	Negative	Slightly Negative	Very Satisfactory	Negative
Total N	60	60	60	60	60
Mean	4.2167	4.0333	4.2667	4.0667	4.3500
Median	4.5000	4.0000	4.0000	4.0000	5.0000
GR.MED	4.5000	4.1429	4.4118	4.0625	4.6190
MIN	Very Negative	Very Negative	Very Negative	Very Negative	Very Negative
MAX	Excellent	Excellent	Excellent	Excellent	Excellent
STDEV	2.18695	1.95688	1.96466	2.12225	2.09782

Note. Limited to first 60 cases.

Table 6

Resource Performance

Case Processing Summary

Questions	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
RP1	60	100.0%	0	0.0%	60	100.0%
RP2	60	100.0%	0	0.0%	60	100.0%
RP3	60	100.0%	0	0.0%	60	100.0%
RP4	60	100.0%	0	0.0%	60	100.0%
RP5	60	100.0%	0	0.0%	60	100.0%

Note. Limited to first 60 cases.

The Resource Performance Cluster was represented by items RP1 to RP5. RP1's average was 3.86; RP2 was at 4.33; RP3 at 3.95; RP4 at 3.66 and RP5 came in at 3.53. The mean for the entire Resource Performance Cluster was 3.87, out of a maximum score of 7. This means that from a statistical perspective, the Resource Performance of the Pakistani pharmaceutical industry's supply chain was more negative than positive. This can be evidenced by the fact that the overall score for this cluster went below the neutral level of 4.0 as dictated by the questionnaire's Likert distribution.

Table 7

Resource Performance Case Summaries

Case Summaries					
Case N	RP1	RP2	RP3	RP4	RP5
1	Very Satisfactory	Excellent	Very Negative	Slightly Negative	Neutral
2	Slightly Negative	Neutral	Excellent	Satisfactory	Excellent
3	Very Negative	Negative	Very Negative	Neutral	Very Satisfactory
4	Very Satisfactory	Negative	Satisfactory	Very Negative	Negative
5	Slightly Negative	Slightly Negative	Satisfactory	Slightly Negative	Slightly Negative
6	Very Satisfactory	Excellent	Very Satisfactory	Neutral	Negative
7	Very Satisfactory	Neutral	Very Satisfactory	Satisfactory	Very Negative
8	Neutral	Excellent	Satisfactory	Very Negative	Negative
9	Negative	Very Negative	Slightly Negative	Excellent	Negative
10	Neutral	Satisfactory	Neutral	Slightly Negative	Excellent
11	Satisfactory	Very Satisfactory	Negative	Neutral	Very Satisfactory
12	Negative	Excellent	Negative	Satisfactory	Very Satisfactory
13	Neutral	Very Negative	Excellent	Very Negative	Very Satisfactory
14	Slightly Negative	Neutral	Negative	Excellent	Excellent
15	Very Satisfactory	Satisfactory	Negative	Slightly Negative	Negative
16	Neutral	Excellent	Satisfactory	Very Satisfactory	Very Negative

Case Summaries

Case N	RP1	RP2	RP3	RP4	RP5
17	Satisfactory	Satisfactory	Neutral	Neutral	Slightly Negative
18	Satisfactory	Negative	Very Negative	Neutral	Negative
19	Very Satisfactory	Negative	Very Negative	Excellent	Very Satisfactory
20	Slightly Negative	Excellent	Neutral	Negative	Negative
21	Slightly Negative	Excellent	Very Satisfactory	Slightly Negative	Excellent
22	Very Satisfactory	Neutral	Slightly Negative	Negative	Negative
23	Neutral	Excellent	Neutral	Slightly Negative	Satisfactory
24	Very Satisfactory	Neutral	Neutral	Very Satisfactory	Very Satisfactory
25	Negative	Slightly Negative	Satisfactory	Negative	Very Negative
26	Negative	Slightly Negative	Slightly Negative	Negative	Very Negative
27	Excellent	Satisfactory	Neutral	Very Negative	Negative
28	Very Negative	Negative	Excellent	Slightly Negative	Neutral
29	Very Negative	Very Satisfactory	Negative	Negative	Very Negative
30	Excellent	Very Negative	Excellent	Satisfactory	Slightly Negative
31	Excellent	Satisfactory	Negative	Neutral	Satisfactory
32	Slightly Negative	Satisfactory	Neutral	Satisfactory	Satisfactory
33	Very Negative	Slightly Negative	Very Negative	Very Negative	Slightly Negative
34	Very Negative	Very Satisfactory	Excellent	Very Negative	Very Satisfactory

Case Summaries

Case N	RP1	RP2	RP3	RP4	RP5
35	Very Negative	Slightly Negative	Slightly Negative	Excellent	Very Negative
36	Slightly Negative	Excellent	Excellent	Neutral	Excellent
37	Very Satisfactory	Very Satisfactory	Neutral	Satisfactory	Satisfactory
38	Very Satisfactory	Slightly Negative	Slightly Negative	Satisfactory	Very Satisfactory
39	Very Satisfactory	Excellent	Very Negative	Very Satisfactory	Neutral
40	Very Negative	Satisfactory	Negative	Very Negative	Negative
41	Very Satisfactory	Very Satisfactory	Neutral	Excellent	Slightly Negative
42	Very Negative	Negative	Satisfactory	Slightly Negative	Very Negative
43	Very Negative	Excellent	Slightly Negative	Neutral	Very Satisfactory
44	Neutral	Slightly Negative	Slightly Negative	Very Negative	Negative
45	Negative	Excellent	Slightly Negative	Negative	Very Negative
46	Very Satisfactory	Neutral	Negative	Slightly Negative	Very Negative
47	Satisfactory	Very Negative	Slightly Negative	Excellent	Negative
48	Excellent	Very Satisfactory	Excellent	Very Satisfactory	Neutral
49	Negative	Very Negative	Negative	Satisfactory	Negative
50	Very Satisfactory	Negative	Satisfactory	Satisfactory	Neutral
51	Slightly Negative	Satisfactory	Neutral	Slightly Negative	Negative
52	Excellent	Slightly Negative	Slightly Negative	Very Negative	Slightly Negative

Case Summaries

Case N	RP1	RP2	RP3	RP4	RP5
53	Neutral	Very Satisfactory	Satisfactory	Satisfactory	Excellent
54	Negative	Neutral	Excellent	Negative	Satisfactory
55	Negative	Slightly Negative	Neutral	Slightly Negative	Slightly Negative
56	Excellent	Very Negative	Excellent	Very Negative	Very Negative
57	Negative	Satisfactory	Very Satisfactory	Very Satisfactory	Slightly Negative
58	Satisfactory	Neutral	Neutral	Excellent	Very Negative
59	Very Negative	Satisfactory	Very Satisfactory	Very Negative	Negative
60	Very Negative	Satisfactory	Negative	Very Negative	Very Satisfactory
Total N	60	60	60	60	60
Mean	3.8667	4.3333	3.9500	3.6667	3.5333
Median	4.0000	4.5000	4.0000	3.5000	3.0000
GR.MED	3.8000	4.4211	3.8182	3.5789	3.0000
MIN	Very Negative	Very Negative	Very Negative	Very Negative	Very Negative
MAX	Excellent	Excellent	Excellent	Excellent	Excellent
STDEV	2.08682	1.98013	1.89938	1.98867	2.07051

Note. Limited to first 60 cases.

Table 8

Output Performance

Case Processing Summary

Questions	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
OP1	60	100.0%	0	0.0%	60	100.0%
OP2	60	100.0%	0	0.0%	60	100.0%
OP3	60	100.0%	0	0.0%	60	100.0%
OP4	60	100.0%	0	0.0%	60	100.0%
OP5	60	100.0%	0	0.0%	60	100.0%
OP6	60	100.0%	0	0.0%	60	100.0%
OP7	60	100.0%	0	0.0%	60	100.0%

Note. Limited to first 60 cases.

The Output Performance questionnaire item cluster was represented by OP1 to OP7. The average for each can be found in the descriptive statistics table at the end of results and findings. The mean for the entire Output Performance Cluster was 4.05. This put it closer to the score obtained in the Supply Chain Agility Performance Cluster. This means that it too has a more natively neutral score as evidenced by its statistical closeness to the score of 4.0.

Table 9

Output Performance Case Summaries

Case Summaries							
Case N	OP1	OP2	OP3	OP4	OP5	OP6	OP7
1	Very Satisfactory	Excellent	Very Satisfactory	Slightly Negative	Very Satisfactory	Satisfactory	Negative
2	Neutral	Satisfactory	Negative	Satisfactory	Satisfactory	Neutral	Excellent
3	Neutral	Excellent	Neutral	Excellent	Negative	Satisfactory	Very Satisfactory
4	Neutral	Neutral	Negative	Very Negative	Negative	Very Negative	Neutral
5	Excellent	Slightly Negative	Very Negative	Satisfactory	Satisfactory	Slightly Negative	Neutral
6	Satisfactory	Negative	Negative	Satisfactory	Satisfactory	Very Satisfactory	Very Satisfactory
7	Very Negative	Slightly Negative	Excellent	Satisfactory	Slightly Negative	Satisfactory	Negative
8	Negative	Very Satisfactory	Slightly Negative	Slightly Negative	Very Negative	Satisfactory	Excellent
9	Negative	Neutral	Satisfactory	Very Satisfactory	Negative	Very Negative	Slightly Negative
10	Neutral	Negative	Very Satisfactory	Excellent	Very Negative	Satisfactory	Neutral

Case Summaries

Case N	OP1	OP2	OP3	OP4	OP5	OP6	OP7
11	Negative	Slightly Negative	Very Satisfactory	Negative	Satisfactory	Slightly Negative	Satisfactory
12	Satisfactory	Very Negative	Slightly Negative	Satisfactory	Excellent	Neutral	Excellent
13	Excellent	Very Negative	Very Negative	Very Satisfactory	Neutral	Very Negative	Neutral
14	Neutral	Excellent	Satisfactory	Negative	Very Satisfactory	Satisfactory	Negative
15	Very Negative	Very Satisfactory	Very Negative	Slightly Negative	Slightly Negative	Slightly Negative	Neutral
16	Very Negative	Negative	Very Negative	Slightly Negative	Satisfactory	Excellent	Satisfactory
17	Excellent	Excellent	Very Negative	Satisfactory	Slightly Negative	Very Satisfactory	Very Negative
18	Neutral	Slightly Negative	Neutral	Very Satisfactory	Negative	Very Satisfactory	Very Negative
19	Negative	Very Satisfactory	Very Satisfactory	Very Negative	Neutral	Negative	Negative
20	Negative	Negative	Very Negative	Satisfactory	Negative	Neutral	Slightly Negative
21	Slightly Negative	Neutral	Excellent	Very Satisfactory	Neutral	Neutral	Satisfactory
22	Very Negative	Neutral	Negative	Negative	Neutral	Very Satisfactory	Excellent

Case Summaries

Case N	OP1	OP2	OP3	OP4	OP5	OP6	OP7
23	Excellent	Negative	Satisfactory	Very Negative	Slightly Negative	Satisfactory	Very Satisfactory
24	Negative	Neutral	Slightly Negative	Very Negative	Slightly Negative	Very Negative	Negative
25	Slightly Negative	Slightly Negative	Negative	Slightly Negative	Very Negative	Neutral	Satisfactory
26	Very Negative	Very Satisfactory	Very Satisfactory	Satisfactory	Satisfactory	Neutral	Neutral
27	Very Satisfactory	Excellent	Excellent	Negative	Excellent	Negative	Excellent
28	Very Satisfactory	Very Negative	Satisfactory	Negative	Excellent	Negative	Very Satisfactory
29	Very Satisfactory	Neutral	Very Satisfactory	Neutral	Slightly Negative	Excellent	Very Negative
30	Neutral	Very Satisfactory	Negative	Slightly Negative	Excellent	Very Satisfactory	Very Satisfactory
31	Very Negative	Neutral	Negative	Very Satisfactory	Slightly Negative	Negative	Very Satisfactory
32	Very Negative	Excellent	Excellent	Very Satisfactory	Very Satisfactory	Very Satisfactory	Satisfactory
33	Slightly Negative	Satisfactory	Excellent	Satisfactory	Neutral	Very Satisfactory	Very Negative
34	Slightly Negative	Slightly Negative	Excellent	Very Satisfactory	Slightly Negative	Excellent	Neutral

Case Summaries

Case N	OP1	OP2	OP3	OP4	OP5	OP6	OP7
35	Satisfactory	Slightly Negative	Excellent	Excellent	Very Negative	Negative	Negative
36	Excellent	Very Satisfactory	Satisfactory	Excellent	Negative	Satisfactory	Excellent
37	Satisfactory	Very Satisfactory	Satisfactory	Satisfactory	Excellent	Very Negative	Very Satisfactory
38	Very Satisfactory	Very Negative	Neutral	Satisfactory	Slightly Negative	Neutral	Slightly Negative
39	Slightly Negative	Satisfactory	Neutral	Excellent	Excellent	Slightly Negative	Very Negative
40	Neutral	Slightly Negative	Excellent	Very Satisfactory	Slightly Negative	Very Satisfactory	Slightly Negative
41	Very Satisfactory	Very Satisfactory	Very Satisfactory	Neutral	Very Negative	Negative	Satisfactory
42	Excellent	Very Satisfactory	Very Negative	Excellent	Slightly Negative	Slightly Negative	Satisfactory
43	Neutral	Negative	Excellent	Very Negative	Very Satisfactory	Slightly Negative	Very Negative
44	Very Satisfactory	Neutral	Very Satisfactory	Neutral	Satisfactory	Satisfactory	Satisfactory
45	Slightly Negative	Very Satisfactory	Neutral	Satisfactory	Very Negative	Negative	Negative
46	Satisfactory	Slightly Negative	Neutral	Satisfactory	Negative	Slightly Negative	Neutral

Case Summaries

Case N	OP1	OP2	OP3	OP4	OP5	OP6	OP7
47	Neutral	Negative	Very Negative	Negative	Very Satisfactory	Satisfactory	Very Negative
48	Very Satisfactory	Very Satisfactory	Neutral	Very Satisfactory	Satisfactory	Neutral	Satisfactory
49	Slightly Negative	Satisfactory	Excellent	Negative	Excellent	Slightly Negative	Negative
50	Very Negative	Neutral	Satisfactory	Very Satisfactory	Negative	Excellent	Very Satisfactory
51	Excellent	Slightly Negative	Very Negative	Neutral	Very Negative	Slightly Negative	Very Negative
52	Neutral	Neutral	Excellent	Satisfactory	Very Satisfactory	Very Negative	Very Negative
53	Neutral	Very Negative	Very Satisfactory	Excellent	Very Negative	Satisfactory	Neutral
54	Neutral	Very Negative	Very Negative	Very Negative	Excellent	Negative	Excellent
55	Slightly Negative	Neutral	Neutral	Neutral	Excellent	Very Negative	Slightly Negative
56	Slightly Negative	Negative	Negative	Neutral	Satisfactory	Excellent	Negative
57	Very Satisfactory	Neutral	Negative	Very Negative	Neutral	Neutral	Neutral
58	Satisfactory	Neutral	Slightly Negative	Very Satisfactory	Slightly Negative	Negative	Slightly Negative

Case Summaries

Case N	OP1	OP2	OP3	OP4	OP5	OP6	OP7
59	Satisfactory	Very Satisfactory	Very Negative	Excellent	Satisfactory	Negative	Excellent
60	Very Satisfactory	Very Negative	Very Satisfactory	Satisfactory	Satisfactory	Neutral	Satisfactory
Total N	60	60	60	60	60	60	60
Mean	4.0500	3.9833	4.1833	4.3333	3.9667	3.8667	3.9833
Median	4.0000	4.0000	4.0000	5.0000	4.0000	4.0000	4.0000
GR.MED	4.0500	3.8696	4.4000	4.6667	3.8889	3.8947	4.1000
MIN	Very Negative	Very Negative	Very Negative	Very Negative	Very Negative	Very Negative	Very Negative
MAX	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
STDEV	1.90828	1.89103	2.19005	1.93686	1.98269	1.83623	2.00416

Note. Limited to first 60 cases.

Based on the Results and Findings from the 3 clusters, it can be seen that the Supply Chain Agility Performance and Output Performance were virtually tied. The main weakness of the Supply Chain Network of Pakistan's Pharmaceutical Industry was its Resource Performance. This was evidenced by the fact that it got the lowest score, below the neutral score of 4.0.

Table 10

Descriptive Table

Questions	Descriptive Statistics				
	N	MIN	MAX	Mean	STDEV
D1	60	1	5	3.07	1.494
D2	60	1	6	3.47	1.732
D3	60	1	6	3.48	1.631
D4	60	1	6	3.53	1.722
SC1	60	1.00	7.00	4.2167	2.18695
SC2	60	1.00	7.00	4.0333	1.95688
SC3	60	1.00	7.00	4.2667	1.96466
SC4	60	1.00	7.00	4.0667	2.12225
SC5	60	1.00	7.00	4.3500	2.09782
RP1	60	1.00	7.00	3.8667	2.08682
RP2	60	1.00	7.00	4.3333	1.98013
RP3	60	1.00	7.00	3.9500	1.89938
RP4	60	1.00	7.00	3.6667	1.98867
RP5	60	1.00	7.00	3.5333	2.07051
OP1	60	1.00	7.00	4.0500	1.90828
OP2	60	1.00	7.00	3.9833	1.89103
OP3	60	1.00	7.00	4.1833	2.19005
OP4	60	1.00	7.00	4.3333	1.93686
OP5	60	1.00	7.00	3.9667	1.98269
OP6	60	1.00	7.00	3.8667	1.83623
OP7	60	1.00	7.00	3.9833	2.00416
Valid N (listwise)	60				

Note. Limited to first 60 cases.

The main findings that were important for the research's objectives were mentioned in the discussions of the findings per cluster. A more important part to mention would be the descriptive statistics table. This was the reference table used to compute the average score per cluster. The grand mean for the entire questionnaire from SC1 to OP7 was 4.03. This means that overall, the performance of Pakistan's Pharmaceutical Industry's Supply Chain was neither negative nor positive, only neutral. For further analysis of per question cluster summary and percentage response, consult Appendix A.

Conclusions and Recommendations

The objective of this study was to examine the supply chain network performance of the pharmaceutical industry in Pakistan. A quantitative research design was used in the present study to meet the research aims and objectives. A custom- made questionnaire was used in order to collect data from the respondents. There was a total of 60 respondents, all of whom were members of Pakistan's pharmaceutical industry's supply chain network. It has been asserted that the pharmaceutical industry's SCM practices play an integral role in the maintenance of a fully functional pharmaceutical industry. This was an important investigation of Pakistan's pharmaceutical industry's supply chain performance. This was evaluated using the custom-made questionnaire. The 60 respondents were chosen based on the assumption that they are the ones with the most reliable and sufficient knowledge of the target industry. A thorough review of the related literature was also conducted in an effort to back up the claims, assumptions, and expectations that were made with data coming from previously published studies. The consensus was that the pharmaceutical industry in Pakistan's supply chain framework has been underperforming for many years already. This consensus was backed by numerous previously published studies. It is worth noting, however, that the industry and its supply chain network is still growing at a very fast rate. At its current state, there have been numerous areas of improvement that were noted. In order to conduct a more precise analysis of Pakistan's pharmaceutical industry's supply chain network, the questionnaire was divided into three clusters. It is worth noting that supply chain flexibility/agility, resource performance, and output performance were the top three variables that were covered in this study. Each of the variables was divided into different questions. Supply chain flexibility performance and resource performance were divided into five individual questionnaire items. The data analysis focused on

providing a summary of the cases that were analyzed, all 60 of them, across all of the questionnaire items and clusters. Data that showed the descriptive statistical analysis outcomes were also shown.

In order to analyze the data, one has to know how the questionnaire items were graded. A 7 Point Likert Scale was used to answer all of the questions, except for D1 (Demographic) to D4. Based on how the questionnaire was created, a score that is closer to 7 would indicate a positive perception about a specific cluster or cluster item. The opposite of this would be true for a score that is closer to 1. In general, the higher the score is, the more positive the performance of the Pakistani pharmaceutical industry's supply chain network. Focusing on the results, the mean for the supply chain agility or flexibility performance was 4.21. The mean for the resource performance cluster was 3.86. The mean for output performance was 4.05. A score of 4 represents neutrality (neither positive nor negative). Individually, the per-cluster mean scores show an affinity towards neutrality. The grand mean score across all of the 3 clusters was 4.04. This means that the perceptions of the respondents, all of whom were verified members of Pakistan's pharmaceutical industry's supply chain network, suggest that performance was neither positive nor negative. This leads to the question on whether this key finding is in line with the expectations and research questions, and the outcomes of the review of related literature. The answer is yes. It is worth mentioning that the consensus was that Pakistan's pharmaceutical industry's SCM performance still has a lot of room for improvement but that it is also improving and growing at an impressively fast rate. An overall score of 4.04 was in line with this consensus. It would, therefore, be safe to suggest that the results and findings of this study validate that of the previously published studies.

One of the limitations of this study was that only a small sample size was used, i.e. 60 respondents. The recommendation for future researchers then would be to make use of a significantly larger sample population. Another recommendation would be to focus more on one supply chain management aspect, one of the three clusters so that a narrower research question and a corresponding set of objectives could be developed. For the stakeholders of the study, the recommendation is to make use of the results and findings found in this study to focus on the aspects that were listed under the three clusters: supply chain flexibility, resource performance, and output performance. The weakest area was identified to be the resource performance area of Pakistan's pharmaceutical industry's supply chain network as it got the lowest score of 3.86, significantly below the 4 which was the neutral territory. This may be because the total resources used, cost of distribution (including transportation and handling costs), cost of manufacturing, labor, maintenance, and re-work, inventory, and low returns on investment were found to be less than optimal in this cluster. It is worth noting, however, that this score is not far away from the scores of other clusters.

Appendix A: Questionnaire and Per Question Cluster Summary

Supply Chain Performance in the Pharmaceutical Industry in Pakistan Questionnaire							
Instruction: Rate each aspect of Pakistan's Pharmaceutical Industry's Supply Chain Performance by choosing/putting a mark on the best description that applies	Very Negative (1)	Negative (2)	Slightly Negative (3)	Neutral (4)	Satisfactory (5)	Very Satisfactory (6)	Excellent (7)
Supply Chain Flexibility/Agility Performance (FP)							
Ability to respond to and accommodate demand variations, such as seasonality.							
Ability to respond to and accommodate the periods of poor manufacturing performance such as machine breakdown.							
Ability to respond to and accommodate the periods of poor supplier performance.							
Ability to respond to and accommodate the periods of poor delivery performance.							
Ability to respond to and accommodate new products, new markets, or new competitors.							
Supply Chain Resource Performance (RP)							
Total cost of resources used							
Total cost of distribution, including transportation and handling cost							
Total cost of manufacturing, including labor, maintenance, and re-work cost.							
Cost associated with held inventory							
Return on investment							
Supply Chain Output Performance (OP)							
Sales							
Order Fill Rate							
On-Time Deliveries							
Customer Response Time							
Shipping Errors							
Manufacturing Lead Time							
Customer Complaints							

Demographic profile of company	
Please check (√) the appropriate box/column	
D1. Numbers of Employees at company: □ • Less than 50 □ • 50 - 100 □ • 100 - 250 □ • 250 - 500 □ • More than 500	**D2. Annual sales of this company in (RS) is:** □ • Less than 1 million □ • 1 – 5 million □ • 5 – 10 million □ • 10 – 50 million □ • 50 – 100 million □ • More than 100 million
D3. Years of experience at this company: □ • Less than 1 year □ • 1 – 5 years □ • 5 – 10 years □ • 10 – 15 years □ • 15 – 20 years □ • More than 20 years	**D4. What is your highest level of education completed** □ Matriculation-Secondary school/O-levels □ Intermediate-Higher secondary school/A-levels □ Technical/vocational education □ Bachelor's degree □ Master's degree □ Ph.D./Doctorate degree

Per Question Cluster Summaries

D1

		Value	Count	Percent
Standard Attributes	Position	1		
	Label	<none>		
	Type	Numeric		
	Format	F8		
	Measurement	Nominal		
	Role	Input		
Valid Values	1	Less Than %0	14	23.3%
	2	50 to 100	8	13.3%
	3	100 to 250	12	20.0%
	4	250 to 500	12	20.0%
	5	More than 500	14	23.3%

D2

		Value	Count	Percent
Standard Attributes	Position	2		
	Label	<none>		
	Type	Numeric		
	Format	F8		
	Measurement	Nominal		
	Role	Input		
Valid Values	1	Less than 1 Million	9	15.0%
	2	1 to 5 Million	14	23.3%
	3	5 to 10 Million	8	13.3%
	4	10 to 50 Million	7	11.7%
	5	50 to 100 Million	13	21.7%
	6	More than 100 Million	9	15.0%

D3

		Value	Count	Percent
Standard Attributes	Position	3		
	Label	<none>		
	Type	Numeric		
	Format	F8		
	Measurement	Nominal		
	Role	Input		
Valid Values	1	Less than 1 Year	10	16.7%
	2	1 to 5 Years	7	11.7%
	3	5 to 10 Years	13	21.7%
	4	10 to 15 Years	12	20.0%
	5	15 to 20 Years	10	16.7%
	6	More than 20 Years	8	13.3%

D4

		Value	Count	Percent
Standard Attributes	Position	4		
	Label	<none>		
	Type	Numeric		
	Format	F8		
	Measurement	Nominal		
	Role	Input		
Valid Values	1	Secondary School	9	15.0%
	2	Intermediate Higher Secondary School	10	16.7%
	3	Technical or Vocational Education	13	21.7%
	4	Bachelor's Degree	7	11.7%
	5	Master's Degree	10	16.7%
	6	Ph.D./Doctorate Degree	11	18.3%

SC1

		Value	Count	Percent
Standard Attributes	Position	5		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	8	13.3%
	2.00	Negative	13	21.7%
	3.00	Slightly Negative	2	3.3%
	4.00	Neutral	7	11.7%
	5.00	Satisfactory	7	11.7%
	6.00	Very Satisfactory	11	18.3%
	7.00	Excellent	12	20.0%

SC2

		Value	Count	Percent
Standard Attributes	Position	6		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	9	15.0%
	2.00	Negative	6	10.0%
	3.00	Slightly Negative	9	15.0%
	4.00	Neutral	9	15.0%
	5.00	Satisfactory	12	20.0%
	6.00	Very Satisfactory	7	11.7%
	7.00	Excellent	8	13.3%

SC3

		Value	Count	Percent
Standard Attributes	Position	7		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	7	11.7%
	2.00	Negative	7	11.7%
	3.00	Slightly Negative	7	11.7%
	4.00	Neutral	11	18.3%
	5.00	Satisfactory	6	10.0%
	6.00	Very Satisfactory	14	23.3%
	7.00	Excellent	8	13.3%

SC4

		Value	Count	Percent
Standard Attributes	Position	8		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	11	18.3%
	2.00	Negative	5	8.3%
	3.00	Slightly Negative	9	15.0%
	4.00	Neutral	9	15.0%
	5.00	Satisfactory	7	11.7%
	6.00	Very Satisfactory	8	13.3%
	7.00	Excellent	11	18.3%

SC5

		Value	Count	Percent
Standard Attributes	Position	9		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	8	13.3%
	2.00	Negative	9	15.0%
	3.00	Slightly Negative	2	3.3%
	4.00	Neutral	9	15.0%
	5.00	Satisfactory	12	20.0%
	6.00	Very Satisfactory	7	11.7%
	7.00	Excellent	13	21.7%

RP1

		Value	Count	Percent
Standard Attributes	Position	10		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	11	18.3%
	2.00	Negative	9	15.0%
	3.00	Slightly Negative	8	13.3%
	4.00	Neutral	7	11.7%
	5.00	Satisfactory	5	8.3%
	6.00	Very Satisfactory	14	23.3%
	7.00	Excellent	6	10.0%

RP2

		Value	Count	Percent
Standard Attributes	Position	11		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	6	10.0%
	2.00	Negative	7	11.7%
	3.00	Slightly Negative	9	15.0%
	4.00	Neutral	8	13.3%
	5.00	Satisfactory	11	18.3%
	6.00	Very Satisfactory	7	11.7%
	7.00	Excellent	12	20.0%

RP3

		Value	Count	Percent
Standard Attributes	Position	12		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	6	10.0%
	2.00	Negative	10	16.7%
	3.00	Slightly Negative	10	16.7%
	4.00	Neutral	12	20.0%
	5.00	Satisfactory	8	13.3%
	6.00	Very Satisfactory	5	8.3%
	7.00	Excellent	9	15.0%

RP4

		Value	Count	Percent
Standard Attributes	Position	13		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	12	20.0%
	2.00	Negative	7	11.7%
	3.00	Slightly Negative	11	18.3%
	4.00	Neutral	8	13.3%
	5.00	Satisfactory	10	16.7%
	6.00	Very Satisfactory	5	8.3%
	7.00	Excellent	7	11.7%

RP5

		Value	Count	Percent
Standard Attributes	Position	14		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	11	18.3%
	2.00	Negative	15	25.0%
	3.00	Slightly Negative	8	13.3%
	4.00	Neutral	5	8.3%
	5.00	Satisfactory	5	8.3%
	6.00	Very Satisfactory	10	16.7%
	7.00	Excellent	6	10.0%

OP1

		Value	Count	Percent
Standard Attributes	Position	15		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	8	13.3%
	2.00	Negative	6	10.0%
	3.00	Slightly Negative	9	15.0%
	4.00	Neutral	13	21.7%
	5.00	Satisfactory	7	11.7%
	6.00	Very Satisfactory	10	16.7%
	7.00	Excellent	7	11.7%

OP2

		Value	Count	Percent
Standard Attributes	Position	16		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	7	11.7%
	2.00	Negative	8	13.3%
	3.00	Slightly Negative	10	16.7%
	4.00	Neutral	13	21.7%
	5.00	Satisfactory	4	6.7%
	6.00	Very Satisfactory	12	20.0%
	7.00	Excellent	6	10.0%

OP3

		Value	Count	Percent
Standard Attributes	Position	17		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	10	16.7%
	2.00	Negative	9	15.0%
	3.00	Slightly Negative	4	6.7%
	4.00	Neutral	8	13.3%
	5.00	Satisfactory	7	11.7%
	6.00	Very Satisfactory	10	16.7%
	7.00	Excellent	12	20.0%

OP4

		Value	Count	Percent
Standard Attributes	Position	18		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	7	11.7%
	2.00	Negative	7	11.7%
	3.00	Slightly Negative	6	10.0%
	4.00	Neutral	6	10.0%
	5.00	Satisfactory	15	25.0%
	6.00	Very Satisfactory	11	18.3%
	7.00	Excellent	8	13.3%

OP5

		Value	Count	Percent
Standard Attributes	Position	19		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	8	13.3%
	2.00	Negative	8	13.3%
	3.00	Slightly Negative	12	20.0%
	4.00	Neutral	6	10.0%
	5.00	Satisfactory	11	18.3%
	6.00	Very Satisfactory	6	10.0%
	7.00	Excellent	9	15.0%

OP6

		Value	Count	Percent
Standard Attributes	Position	20		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	7	11.7%
	2.00	Negative	10	16.7%
	3.00	Slightly Negative	9	15.0%
	4.00	Neutral	10	16.7%
	5.00	Satisfactory	11	18.3%
	6.00	Very Satisfactory	8	13.3%
	7.00	Excellent	5	8.3%

OP7

		Value	Count	Percent
Standard Attributes	Position	21		
	Label	<none>		
	Type	Numeric		
	Format	F8.2		
	Measurement	Nominal		
	Role	Input		
Valid Values	1.00	Very Negative	9	15.0%
	2.00	Negative	9	15.0%
	3.00	Slightly Negative	6	10.0%
	4.00	Neutral	10	16.7%
	5.00	Satisfactory	10	16.7%
	6.00	Very Satisfactory	8	13.3%
	7.00	Excellent	8	13.3%

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